Remarks/Arguments:

Reconsideration of the application is requested.

Claims 1-21 remain in the application. Claim 21 has been amended.

In item 2 on page 2 of the Office action, claims 1, 5, 8-13, 15, and 16 have been rejected as being fully anticipated by Yu et al. (U.S. Patent No. 6,399,450) (hereinafter "Yu") under 35 U.S.C. § 102.

It is noted that the Yu reference has an effective U.S. filing date of July 5, 2000. Enclosed herewith are pages 1 of 4, 2 of 4, a 2-page description, and drawings (pages 3 of 4 and 4 of 4 have not been submitted because they contain confidential company information that is not relevant to the present invention) of an Invention Disclosure. An unsigned declaration under 37 CFR 1.131 indicating that the present invention was reduced to practice at least as early as July 4, 2000, is also enclosed herewith. A signed copy of the declaration will be forwarded to the Patent Office upon receipt from the inventors. Based on the above-noted information, the Lu reference is not available as Prior art. Therefore, the rejection over Yu is moot.

In item 4 on page 2 of the Office action, claims 1 and 2 have been rejected as being fully anticipated by Kameyama et al. (U.S. Patent No. 5,296,388) (hereinafter "Kameyama") under 35 U.S.C. § 102.

As will be explained below, it is believed that the claims were patentable over the cited art in their original form and the claims have, therefore, not been amended to overcome the references.

Before discussing the prior art in detail, it is believed that a brief review of the invention as claimed, would be helpful.

Claim 1 calls for, *inter alia*:

producing a doping at a surface of the semiconductor substrate.

The Kameyama reference discloses that a doping is carried out through a 120nm thick silicon oxide film (108) (column 7, lines 57-63).

The reference does not show producing a doping at a surface of the semiconductor substrate, as recited in claim 1 of the

instant application. The Kameyama reference discloses that a doping is carried out through a 120 nm thick silicon oxide film. This is contrary to the invention of the instant application as claimed, which recites producing a doping at a surface of the semiconductor substrate.

Since claim 1 is believed to be allowable over Kameyama, dependent claim 2 is believed to be allowable over Kameyama as well.

Even though claim 1 is believed to be allowable, the following remarks pertain to the non-obviousness of claim 1.

The advantage of producing a doping at the surface is that the doping profile can be made to be delta-shaped in order to provide a steep retrograde doping profile directly at the surface. The steep retrograde doping profile is perfectly suited for producing doping profiles of short channels of highly integrated CMOS transistors (page 2, line 14 to page 3, line 9 and page 5, lines 14-20 of the specification).

Contrary to the present invention as claimed, Kameyama discloses an implantation through a 120 nm thick silicon oxide film (108) (Fig. 1 and column 7, lines 57-63). Doping through such a thick silicon oxide film does not generate a delta-

shaped doping profile. Instead, it requires higher implantation energies and, therefore, generates a broad doping profile. Moreover, since the implantation of Kameyama is used for providing a base for a bipolar transistor (column 7, lines 59-63), there is no need for providing a delta-shaped doping profile directly at the surface, as an emitter covers the base (Fig. 3 with base layer 106P, emitter region 116n+). Therefore, there is no motivation for a person of ordinary skill in the art to modify the method disclosed in Kameyama to produce a doping at the surface as disclosed in the claims of the instant application.

Furthermore, Kameyama teaches away from a doping at the surface because the silicon oxide film (108) acts as a stray oxide that prevents ion channeling through the silicon substrate lattice during implantation. Channeling is a well-known effect that is to be avoided because it causes troublesome doping profile tails due to the larger penetration range of channeling ions. Accordingly, implanting through an oxide film is beneficial in the method disclosed by Kameyama. Therefore, Kameyama teaches away form the present invention according to claim 1.

In item 6 on page 3 of the Office action, claim 21 has been rejected as being fully anticipated by Taka et al. (U.S.

Patent No. 4,853,342) (hereinafter "Taka") under 35 U.S.C. § 102.

The rejection has been noted and claim 21 has been amended in an effort to even more clearly define the invention of the instant application. The claims are patentable for the reasons set forth below. Support for the changes is found on page 5, lines 14-17 of the specification.

Claim 21 calls for, *inter alia*:

subjecting the assembly to a heat treatment step for producing a monocrystalline layer and a buried doping from the layers and the semiconductor substrate for forming the MOS transistor.

The Taka reference discloses a process for producing a bipolar transistor having a "base/emitter region and a...collector region" (column 3, lines 56-57).

The reference does not show subjecting the assembly to a heat treatment step for producing a monocrystalline layer and a buried doping from the layers and the semiconductor substrate for forming the MOS transistor, as recited in claim 21 of the instant application. The Taka reference discloses a process

for producing a bipolar transistor having a "base/emitter region and a collector region. This is contrary to the invention of the instant application as claimed, which recites subjecting the assembly to a heat treatment step for producing a monocrystalline layer and a buried doping from the layers and the semiconductor substrate for forming the MOS transistor.

Even though claim 21 is believed to be allowable, the following remarks pertain to the non-obviousness of claim 21.

Due to the following reasons, a person of ordinary skill in the art is not given any motivation to modify the process of making the bipolar transistor of Taka to a process for producing a MOS transistor, as claimed in the instant application.

The construction, working principle, and manufacture of a bipolar transistor having a collector, emitter, and base are fundamentally different from the construction, working principle and manufacture of a MOS transistor having a source, drain, and emitter. Therefore, a person of ordinary skill in the art does not have any motivation to use the teaching of a process for producing a bipolar transistor for a MOS transistor.

It is the object of the invention of the instant application according to claim 21 is to solve "short channel effects" caused by "doping in the channel between the source and the drain" (page 2, lines 5-6) by providing "'retrograde' doping" or "delta doping profiles" which are "brought as close as possible to the surface of the semiconductor substrate" (page 2, line 14 to page 3, line 5).

Contrary thereto, in a bipolar transistor, short channel effects are not an issue, because the transistor current of a bipolar transistor is controlled by a current (base current). While the transistor current of a MOS transistor is controlled by an electric field. The difference is fundamental, because contrary to current control, control by an electric field implies a transistor channel extending horizontally and close to the surface of the substrate underneath an electrode (gate electrode), thereby having a predetermined channel length that is related to the size of the gate electrode.

Since current control does not depend on the length of a transistor channel, short channel effects do not apply to a bipolar transistor. In particular, processes for producing bipolar transistors do not have to deal with "retrograde

doping profiles" or "delta doping profiles", which are used in the present invention for compensating short-channel effects.

Based on the above-provided comments, a person of ordinary skill in the art trying to solve short-channel effects would not have any motivation to use the teaching of Taka. Accordingly, claim 21 is not obvious over Taka.

In item 9 on page 3 of the Office action, claims 3, 4, and 7 have been rejected as being obvious over Kameyama (U.S. Patent No. 5,296,388) in view of Maszara et al. (U.S. Patent No. 6,362,063) under 35 U.S.C. § 103. Maszara et al. do not make up for the deficiencies of Kameyama. Since claim 1 is believed to be allowable, dependent claims 3, 4, and 7 are believed to be allowable as well.

In item 13 on page 4 of the Office action, claims 14, 19, and 20 have been rejected as being obvious over Yu (U.S. Patent No. 6,399,450) in view of Maszara et al. (U.S. Patent No. 6,362,063) under 35 U.S.C. § 103. As noted above, the Yu reference is not available as prior art. Accordingly, since claim 1 is believed to be allowable, dependent claims 14, 19, and 20 are believed to be allowable as well.

In item 17 on page 5 of the Office action, claims 17 and 18 have been rejected as being obvious over Yu (U.S. Patent No. 6,399,450) in view of Taka (U.S. Patent No. 4,853,342) under 35 U.S.C. § 103. As noted above, the Yu reference is not available as prior art. Accordingly, since claim 1 is believed to be allowable, dependent claims 17 and 18 are believed to be allowable as well.

It is accordingly believed to be clear that none of the references, whether taken alone or in any combination, either show or suggest the features of claims 1 or 21. Claims 1 and 21 are, therefore, believed to be patentable over the art and since all of the dependent claims are ultimately dependent on claim 1, they are believed to be patentable as well.

In view of the foregoing, reconsideration and allowance of claims 1-21 are solicited.

In the event the Examiner should still find any of the claims to be unpatentable, counsel respectfully requests a telephone call so that, if possible, patentable language can be worked out.

If an extension of time for this paper is required, petition for extension is herewith made.

Applic. No. 09/904,360
Amdt. dated June 29, 2004
Reply to Office action of March 29, 2004

Please charge any other fees which might be due with respect to Sections 1.16 and 1.17 to the Deposit Account of Lerner & Greenberg P.A., No. 12-1099.

Respectfully submitted,

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For Applicant(s)

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